Day of therapy and ratio of the consumption of broad- to the consumption of narrow-spectrum antibiotics for quality indicator of antimicrobial stewardship program in pediatric ward

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Backgrounds

- The appropriate use of antibiotics is important to prevent antimicrobial resistance.
- Because of the individual difference in body weight, Day of Therapy (DOT) is commonly used in pediatrics.
- DOT is difficult to evaluate the influence of the hospitalized days such as the introduction of vaccine and outbreak of some infectious disease.
- Some studies analyzed the ratio of the consumption of broad- to narrow-spectrum (B/N ratio) of oral antibiotics for a quality indicator of antimicrobial stewardship program (ASP).

Objective

- The purpose of this study is to assess B/N ratio of intravenous antibiotics to the indicator of ASP.

Methods

- We retrospectively investigated the usage of antibiotics with electronic medical records from 2011 to 2016 in pediatric wards at Juntendo Nerima Hospital.
- We calculated DOT and B/N ratio (Narrow spectrum: Ampicillin and Cefazolin, Broad spectrum: antibiotics except for Narrow spectrum) every two years.

Table.1 Calculation method

Calculation method	
DOT	$\frac{\text{Day of antibiotics therapy}}{\text{Hospital total days}} \times 1000$ (DOT/1000patient-days)
B/N ratio	$\frac{\text{DOT of broad-spectrum antibiotics}}{\text{DOT of narrow-spectrum antibiotics}}$

Results

- There were no significant differences between the total numbers of hospitalized patients in each period.
- The number of inpatient and the rates of hospitalized days due to bacterial infectious diseases decreased year by year (Table. 2). The total DOT and B/N ratio also decreased significantly (Figure. 1).

Table.2 Characteristics

	2011-12	2013-14	2015-16	p value
The total number of inpatients	1752	1642	1618	n.s.
Hospital total days	11414	11462	11212	n.s.
Male(%)	56.8	57.9	56.9	n.s.
Patient age	3.7	3.8	3.7	n.s.
The rate of patient suffering bacterial infection*(%)	19.1	13.8	12.2	<0.001

* Bacterial infection: The cases diagnosed of bacterial infection by the attending physician

Figure.1 DOT and Broad/Narrow ratio

Discussion

- The quality indicators should be simple.
- DOT is susceptible to various factors such as vaccine policy and infection prevention and control. It is difficult always to perform statistical sensitivity analysis.
- We can evaluate more accurately ASP with using plural marks (Mainly DOT and using B/N ratio by sensitivity analysis of institution).

- Patients can be switched from intravenous to oral antibiotics as soon as their condition allows, but infants and patients with severe or deep seated infections require parenteral antibiotics therapy throughout the treatment period.
 - As antibiotics is being used appropriately, B/N ratio of intravenous antibiotics would not decrease below a certain level.
- We should use several markers for evaluating appropriate use of antibiotics (Figure.2).

Figure.2 The interpretation of combination of DOT and B/N ratio

1. The possibility of inappropriate broad-spectrum antibiotic use, or the increase of severe infection cases.
2. The possibility of appropriate antibiotic use or the decrease of severe infection cases.
3. The possibility of inappropriate antibiotic use, or the increase of prevalence of some bacterial infections.
4. The possibility of appropriate antibiotic use, or the decrease of infection cases due to vaccine, or inappropriate broad-spectrum antibiotic use.

Limitations

- This study is only a single center and retrospective study.
- The most significant limitation is that we evaluate only intravenous antibiotics. It is necessary to calculate DOT of both intravenous and oral antibiotics. Further studies are needed.

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